Trend Study 2-40-01

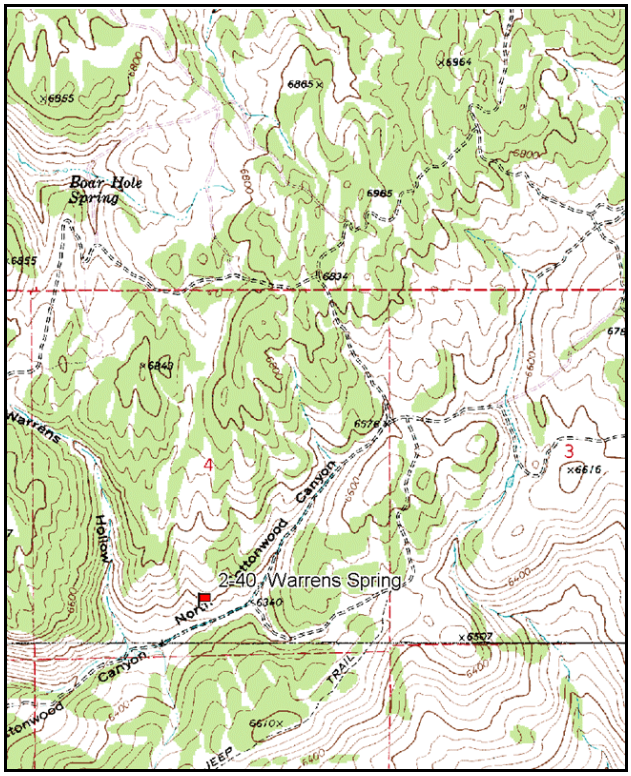
Study site name: Warrens Spring . Vegetation type: Mountain Brush .

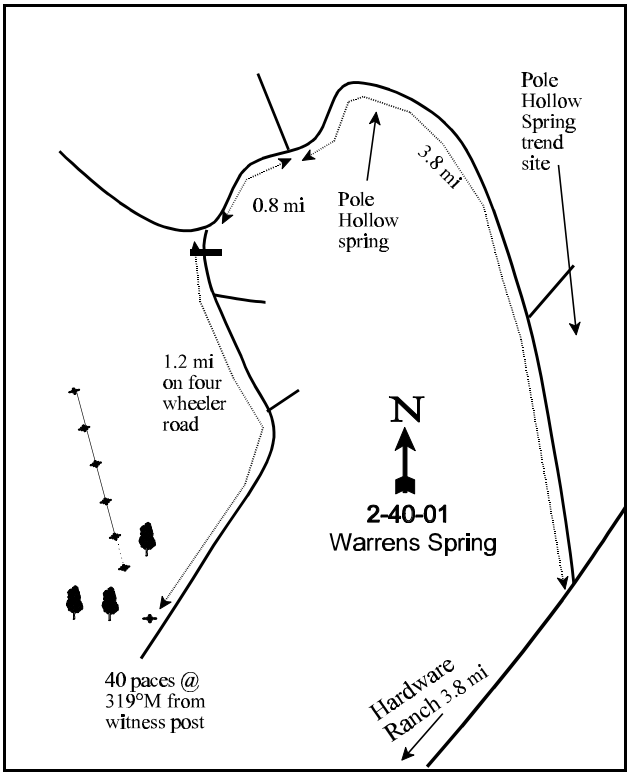
Compass bearing: frequency baseline 10 degrees magnetic.

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (71ft), line 4 (95ft), line 5 (59ft). Rebar: belt 2 on 1 ft, belt 5 on 1 ft.

LOCATION DESCRIPTION

From Hardware Ranch, travel northeast for 3.8 miles to the Pole Hollow Road. Take a left and travel up Pole Hollow 3.8 miles, passing the Pole Hollow trend site and Pole Hollow Spring. Continue on the main road 0.8 miles to a fork. Turn left and go over a cattleguard. Continue down the canyon 1.2 mile to a witness post on the right hand side of the road. From the witness post, walk 40 paces at 319 degrees magnetic to the 0-foot baseline stake. The baseline runs at a bearing of 10 degrees magnetic.





Map Name: Boulder Mountain

Diagrammatic Sketch

Township 10N , Range 3E , Section 5

UTM 4608266 N, 449379 E

DISCUSSION

Trend Study No. 2-40

The Warrens Spring site was established in 1996 to monitor winter range in a mountain brush community west of Hardware Ranch. The study lies on a moderately steep (30%), south-facing slope at an elevation of 6,400 feet. Water is available at Warrens Spring which is about 1/3 of a mile southwest of the study area. The site is used by deer, elk, and cattle. Pellet group transect data collected in 2001 estimated 43 deer days use/acre (107 ddu/ha). Elk use was estimated at 11 days use/acre (28 edu/ha). Numerous trails run through the area and off the hills down to the road in the bottom of the canyon and south to the spring. On the site itself, cattle use is light at an estimated 9 days use/acre (23 cdu/ha) in 2001. However, livestock use is heavy in the bottoms throughout nearly the entire canyon. In 1996, elderberry plants had no leaves left and bitterbrush near the bottom of the canyon were heavily utilized. In addition, species composition in the bottoms is dominated by weeds.

Soils at the site are moderately deep with an estimated effective rooting depth (see methods) of 15 inches. Texture is a clay loam with a neutral pH of 6.8. Rock and pavement account for less than 10% of the ground cover. Some compaction occurs due to numerous livestock trails, as most of the bare ground on the site is associated with these trails. Pedestalling provides the most evidence of past erosion. An erosion condition class completed in 2001 determined erosion to be slight at the present time. Phosphorus is low at only 3.9 ppm as values less than 10 ppm may limit normal plant growth and development.

This mountain brush stand is dominated by mountain big sagebrush which accounts for nearly 70% of the total shrub cover. Mountain big sagebrush has an estimated population of about 2,500 plants/acre, with mature plants making up the majority of the age classes. Utilization on sagebrush was mostly light with some shrubs showing moderate use. In 1996, many of the sagebrush were beginning to drop leaves due to the dry conditions. Vigor has been normal and percent decadence moderately low at 15% or less during both sampling years. Bitterbrush has a low density estimated at 180 plants/acre, which show moderate to heavy use. Bitterbrush decadency decreased to only 11% in 2001. Annual leader growth was relatively low on both mountain big sagebrush and bitterbrush. During the 2001 reading, sagebrush leaders averaged 1.5 inches, while bitterbrush annual growth averaged just under 2 inches. Serviceberry is rare and moderately utilized where found. Other browse found on the site include chokecherry, Woods rose, and snowberry. Chokecherry is usually found growing under the canopy of sagebrush and juniper.

The herbaceous understory is not particularly abundant for a mountain brush community. The grass component is diverse, but bluebunch wheatgrass is the only common perennial species. Cheatgrass and Japanese brome were abundant in 1996, producing 50% of the grass cover. Due to drought in 2001, these species only provided 14% of the grass cover. Both significantly declined in nested frequency. In 2001, bluebunch wheatgrass and Great Basin wildrye both displayed moderate to heavy use where found. Forbs are very diverse and produce nearly as much cover as grasses. Composition is not good however. Annual forbs are abundant as are weedy perennials that include western yarrow, pacific aster, thistle, common sunflower, Dyers woad, and yellow salsify. Perennial herbaceous species have shown a slight increase in sum of nested frequency in 2001, while annual grasses and forbs exhibited a 28% decrease in sum of nested frequency due to the extremely dry conditions.

1996 APPARENT TREND ASSESSMENT

Trend for soil appears stable, but is not in as good condition as the site at Pole Hollow Spring. Vegetation and litter cover are fairly abundant and well dispersed. The only erosion occurring is along cattle trails. The browse trend appears stable for the key species, mountain big sagebrush. Some other browse offer additional forage but they occur in small numbers. The herbaceous understory is diverse and fairly abundant. However, the composition of the grasses and forbs is poor. Half of the grass cover is provided by cheatgrass and

Japanese brome. Most of the forbs are annuals or weedy increasers. Future grazing practices will have a major impact on the herbaceous trend.

2001 TREND ASSESSMENT

Trend for soil is stable. Although bare ground slightly increased, the ratio of bare soil to protective ground cover remains nearly unchanged. The erosion condition class was determined to be slight. Trend for browse is stable. The key species, mountain big sagebrush, has a stable density, low decadency, normal vigor, and mostly light use. Young plants are currently adequate to maintain the population. Trend for the herbaceous understory is stable. The composition, especially for forbs, remains less than ideal with a large number of weeds and increasers present. However, sum of nested frequency for perennial grasses and forbs slightly increased. Another positive factor is the 28% decrease in sum of nested frequency for annual grasses and forbs due to drought.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - stable (3)

HERBACEOUS TRENDS --
Herd unit 02 , Study no: 40

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover %	
		'96	'01	'96	'01	'96	'01
G	Agropyron spicatum	184	*161	64	57	4.42	4.51
G	Agropyron trachycaulum	7	5	3	2	.18	.04
G	Bromus japonicus (a)	142	*69	40	28	2.75	.65
G	Bromus marginatus	5	*23	2	9	.06	.17
G	Bromus tectorum (a)	156	*42	48	17	3.21	.28
G	Elymus cinereus	5	5	1	1	.38	.03
G	Poa bulbosa	16	23	5	6	.34	.53
G	Poa fendleriana	1	-	1	-	.00	-
G	Poa pratensis	12	14	4	4	.45	.19
G	Poa secunda	4	14	2	4	.01	.09
Total for Annual Grasses		298	111	88	45	5.96	0.93
Total for Perennial Grasses		234	245	82	83	5.85	5.58
Total for Grasses		532	356	170	128	11.82	6.52
F	Achillea millefolium	19	31	8	12	.16	.38
F	Agoseris glauca	-	3	-	1	-	.01
F	Alyssum alyssoides (a)	213	*129	63	53	.96	.41
F	Allium spp.	81	*113	34	43	.25	.35
F	Arabis spp.	-	1	-	1	-	.00
F	Artemisia dracunculus	6	-	2	-	.03	-

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover %	
		'96	'01	'96	'01	'96	'01
F	Aster chilensis	30	32	12	10	.66	.75
F	Astragalus spp.	14	4	4	3	.21	.06
F	Astragalus utahensis	1	1	1	1	.03	.00
F	Balsamorhiza sagittata	15	13	7	8	1.33	1.28
F	Castilleja linariaefolia	1	-	1	-	.00	-
F	Camelina microcarpa (a)	-	3	-	3	-	.01
F	Chaenactis douglasii	10	-	4	-	.04	-
F	Cirsium undulatum	6	5	4	2	.27	.06
F	Collomia linearis (a)	40	*107	19	49	.12	.52
F	Comandra pallida	5	2	2	1	.01	.01
F	Collinsia parviflora (a)	44	46	19	20	.41	.15
F	Crepis acuminata	5	1	3	1	.04	.15
F	Cryptantha spp.	-	5	-	2	-	.01
F	Cymopterus spp.	2	3	1	1	.00	.06
F	Descurainia pinnata (a)	-	2	-	1	-	.01
F	Epilobium brachycarpum (a)	65	54	28	17	.61	.26
F	Galium aparine (a)	5	-	2	-	.15	-
F	Hackelia patens	-	4	-	2	-	.03
F	Helianthus annuus (a)	2	-	1	-	.63	-
F	Helianthella uniflora	-	2	-	2	.00	.21
F	Holosteum umbellatum (a)	1	2	1	1	.00	.00
F	Isatis tinctoria	36	*8	12	3	.45	.06
F	Lactuca serriola	1	8	1	4	.03	.02
F	Linum lewisii	15	22	7	9	.14	.14
F	Lithospermum ruderale	-	*5	-	3	.00	.01
F	Lupinus argenteus	11	5	5	4	.85	.21
F	Machaeranthera canescens	1	1	1	1	.02	.03
F	Machaeranthera grindelioides	-	2	-	1	-	.00
F	Microsteris gracilis (a)	33	*60	15	29	.10	.14
F	Penstemon humilis	-	5	-	3	.00	.06
F	Polygonum douglasii (a)	50	28	18	12	.13	.06
F	Senecio multilobatus	-	3	-	1	-	.03
F	Taraxacum officinale	1	3	1	2	.00	.01
F	Tragopogon dubius	21	18	15	11	.40	.23
F	Veronica biloba (a)	166	*121	55	41	.42	.33
F	Viguiera multiflora	5	-	3	-	.04	-

Type	Species	Nested Frequency '96	Nested Frequency '01	Quadrat Frequency '96	Quadrat Frequency '01	Average Cover % '96	Average Cover % '01
F	Wyethia amplexicaulis	1	1	1	1	.18	.15
Total for Annual Forbs		619	552	221	226	3.56	1.91
Total for Perennial Forbs		287	301	129	133	5.22	4.40
Total for Forbs		906	853	350	359	8.79	6.31

* Indicates significant difference at alpha = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 02 , Study no: 40

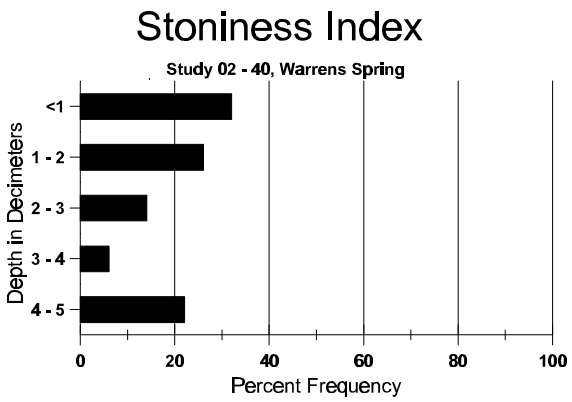
Type	Species	Strip Frequency '96	Strip Frequency '01	Average Cover % '96	Average Cover % '01
B	Amelanchier alnifolia	3	1	.15	-
B	Artemisia tridentata vaseyana	76	74	14.11	20.20
B	Chrysothamnus nauseosus consimilis	2	1	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	24	24	1.19	1.91
B	Eriogonum heracleoides	1	0	.63	-
B	Mahonia repens	5	3	.09	.24
B	Prunus virginiana	4	6	.38	.36
B	Purshia tridentata	9	9	1.69	2.79
B	Rosa woodsii	2	1	.63	.03
B	Symphoricarpos oreophilus	26	25	2.10	3.73
Total for Browse		152	144	20.98	29.29

BASIC COVER --
Herd unit 02 , Study no: 40

Cover Type	Nested Frequency '96	Nested Frequency '01	Average Cover % '96	Average Cover % '01
Vegetation	446	394	38.24	41.59
Rock	178	128	5.32	7.12
Pavement	215	201	2.70	2.44
Litter	490	462	48.71	46.20
Cryptogams	12	1	.10	.00
Bare Ground	293	276	19.22	28.33

SOIL ANALYSIS DATA --
Herd Unit 02, Study no: 40, Warrens Spring

Effective rooting depth (in)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
15.1	59.8 (15.6)	6.8	29.9	35.7	34.4	4.7	12.9	279.4	.7



PELLET GROUP FREQUENCY --
Herd unit 02 , Study no: 40

Type	Quadrat Frequency '96	Quadrat Frequency '01	Pellet Transect Pellet Groups per Acre '01	Pellet Transect Days Use per Acre (ha) '01
Rabbit	2	1	-	-
Elk	4	1	148	11 (28)
Deer	22	14	566	44 (107)
Cattle	1	3	113	9 (23)
Moose	-	-	9	<1 (1)

BROWSE CHARACTERISTICS --
Herd unit 02 , Study no: 40

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
M	96	-	3	-	-	-	-	-	-	-	3	-	-	-	60	36	29	3
	01	-	1	-	-	-	-	-	-	-	1	-	-	-	20	38	41	1
X	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'96	100%	00%	00%	-67%
'01	100%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'96	60	Dec:	-
	'01	20		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	96	2	-	-	1	-	-	-	-	-	3	-	-	-	60			3
	01	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	96	17	-	-	-	-	-	-	-	-	17	-	-	-	340			17
	01	5	-	-	-	-	-	-	-	-	5	-	-	-	100			5
M	96	68	18	-	1	3	-	-	-	-	89	1	-	-	1800	23	38	90
	01	100	4	-	-	-	-	-	-	-	104	-	-	-	2080	23	35	104
D	96	7	9	-	-	-	-	-	-	-	13	-	-	3	320			16
	01	17	2	-	-	-	-	-	-	-	14	-	-	5	380			19
X	96	-	-	-	-	-	-	-	-	-	-	-	-	-	220			11
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	140			7

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'96	24%	00%	02%	+ 4%
'01	05%	00%	04%	

Total Plants/Acre (excluding Dead & Seedlings)				
'96	2460	Dec:		13%
'01	2560			15%

Chrysothamnus nauseosus consimilis																		
M	96	1	1	-	-	-	-	-	-	-	2	-	-	-	40	33	58	2
	01	1	-	-	-	-	-	-	-	-	1	-	-	-	20	22	18	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'96	50%	00%	00%	-50%
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'96	40	Dec:		-
'01	20			-

Chrysothamnus viscidiflorus viscidiflorus																		
Y	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
	01	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	96	37	-	-	4	-	-	-	-	-	39	-	2	-	820	16	23	41
	01	38	-	-	1	-	-	-	-	-	39	-	-	-	780	13	22	39
D	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	01	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'96	00%	00%	05%	- 5%
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'96	880	Dec:		2%
'01	840			2%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Eriogonum heracleoides																		
M	96	-	-	-	1	-	-	-	-	-	1	-	-	-	20	2	4	1
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
% Plants Showing			Moderate Use			Heavy Use			Poor Vigor						%Change			
	'96		00%			00%			00%									
	'01		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)													'96		20	Dec:		-
													'01		0			-
Mahonia repens																		
Y	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
	01	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	96	23	-	-	-	-	-	-	-	-	23	-	-	-	460	5	8	23
	01	31	-	-	-	-	-	-	-	-	31	-	-	-	620	3	5	31
% Plants Showing			Moderate Use			Heavy Use			Poor Vigor						%Change			
	'96		00%			00%			00%						+21%			
	'01		00%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)													'96		520	Dec:		-
													'01		660			-
Prunus virginiana																		
S	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	-	-	-	-	-	1	-	-	1	-	-	-	20			1
Y	96	3	-	-	1	-	-	-	-	-	1	3	-	-	80			4
	01	2	-	-	3	-	-	9	-	-	14	-	-	-	280			14
M	96	1	-	-	1	-	-	-	-	-	-	2	-	-	40	30	28	2
	01	-	-	-	-	1	-	1	-	-	2	-	-	-	40	32	31	2
% Plants Showing			Moderate Use			Heavy Use			Poor Vigor						%Change			
	'96		00%			00%			00%						+63%			
	'01		06%			00%			00%									
Total Plants/Acre (excluding Dead & Seedlings)													'96		120	Dec:		-
													'01		320			-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Purshia tridentata																		
M	96	3	2	1	-	-	1	-	-	-	7	-	-	-	140	24	52	7
	01	1	1	2	-	1	3	-	-	-	8	-	-	-	160	23	49	8
D	96	1	-	-	-	-	-	1	-	-	-	-	-	2	40			2
	01	-	-	-	-	-	1	-	-	-	1	-	-	-	20			1
X	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'96	22%	22%	22%	+ 0%
'01	22%	67%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'96	180	Dec:		22%
'01	180			11%

Rosa woodsii																		
Y	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1
M	96	1	-	-	1	-	-	-	-	-	2	-	-	-	40	14	4	2
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0	22	11	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'96	00%	00%	00%	-50%
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'96	40	Dec:		-
'01	20			-

Symphoricarpos oreophilus																		
S	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	-	-	-	-	-	1	-	-	1	-	-	-	20			1
Y	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
	01	1	-	-	1	-	-	-	-	-	2	-	-	-	40			2
M	96	18	-	-	12	-	-	-	-	-	29	-	1	-	600	21	35	30
	01	23	-	-	10	-	-	2	-	-	35	-	-	-	700	22	36	35
D	96	6	-	-	-	-	-	-	-	-	4	-	1	1	120			6
	01	5	-	-	-	-	-	-	-	-	2	-	-	3	100			5

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'96	00%	00%	08%	+10%
'01	00%	00%	07%	

Total Plants/Acre (excluding Dead & Seedlings)				
'96	760	Dec:		16%
'01	840			12%

Trend Study 2-41-01

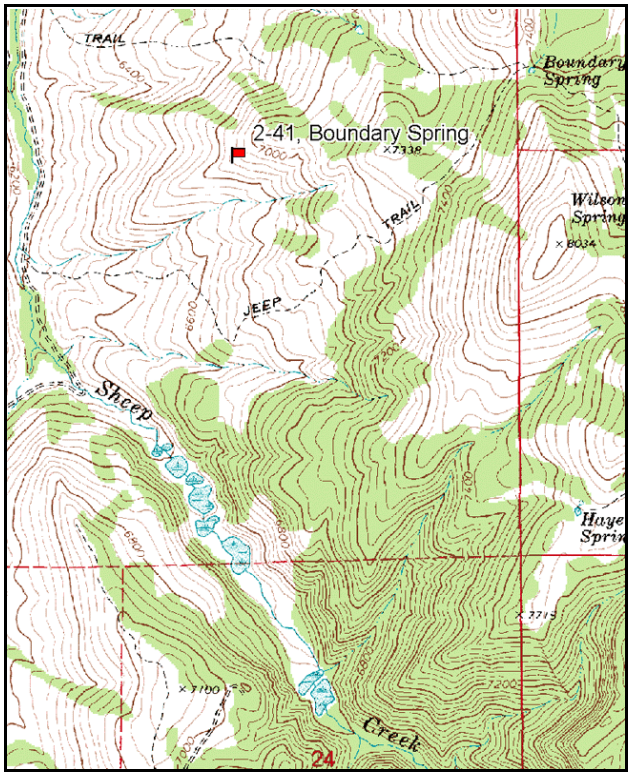
Study site name: Boundary Spring . Vegetation type: Mountain Brush .

Compass bearing: frequency baseline 233 degrees magnetic.

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

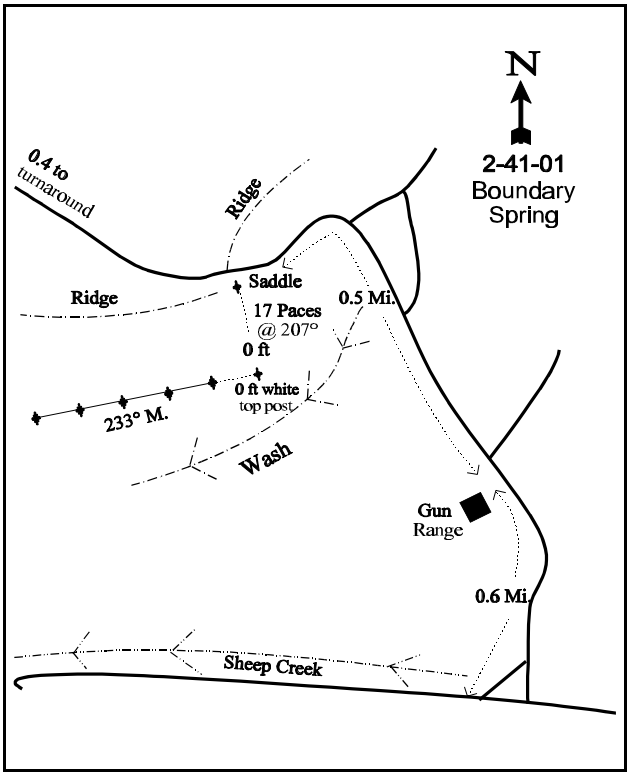
LOCATION DESCRIPTION

From Hardware Ranch, travel south on the Ant Valley Road for 7 miles to the Sheep Creek Ranch. Turn left, go through a gate, and proceed 0.1 miles to a fork in the road. Take a right at the fork and continue on the Sheep Creek Road for 1.1 miles passing by a small reservoir. Go left and continue 0.3. At the next fork go right for 0.5 going past a gun range on the left to a fork in the road. Stay left and continue for 0.6 miles to a witness post on the left hand side of the road. From the witness post, walk 17 paces at a bearing of 207 degrees magnetic. The baseline runs 233 degrees magnetic.



Map Name: Hardware Ranch

Township 9N , Range 3E , Section 13



Diagrammatic Sketch

UTM 4596832 N, 453811 E

DISCUSSION

Trend Study No. 2-41

The Boundary Spring study was established in 1996 to monitor important winter range south of Hardware Ranch. The site is placed on a moderately steep (35%), south-facing slope at an elevation of about 6,700 feet. Even with the higher elevation, the browse on this slope is available for most of the winter due to the aspect and the wind blown nature of the site. The study lies on the eastern edge of the large Sheep Creek Cove development where several large cabins have been built since 1996. Quadrat frequency of deer and elk pellets were abundant in 1996 at 23% and 42% respectively. In 2001, quadrat frequency of deer pellets nearly doubled, while that of elk decreased to 6%. Cattle and domestic sheep also make use of the study site. Pellet group transect data collected in 2001 estimated 52 deer days use/acre (129 ddu/ha), 12 elk days use/acre (30 edu/ha), and less than 1 cow day use/acre (2 cdu/ha). In addition, 44 sheep pellet groups were sampled.

The soil is fairly shallow with effective rooting depth (see methods) estimated at less than 10 inches. Texture is a clay loam with a slightly alkaline soil reaction (pH of 7.4). Rock is common on the surface and throughout the profile. Due to the abundance of vegetation, litter, and rock cover, there is little unprotected bare ground. Erosion is minimal. An erosion condition class assessment completed in 2001 showed soils to be stable.

The site supports a moderate stand of antelope bitterbrush and mountain big sagebrush. Bitterbrush density was estimated at 580 plants/acre in 2001. Mature plants averaged nearly 3 feet in height and over 5 feet in width. Utilization is moderate to heavy, but vigor is normal and decadence is low at 10% or less in both sampling years. The main negative element for bitterbrush is the lack of seedling or young plants in the population. Bitterbrush annual leader growth was relatively good in 2001, averaging almost 5 inches.

Mountain big sagebrush density was estimated at 520 plants/acre in 1996, slightly increasing to 560 in 2001. Some of the shrubs display characteristics of basin big sagebrush. Utilization is mostly light with some plants displaying moderate to heavy use. Like bitterbrush, no reproduction was evident in 1996. However, an estimated 120 young plants/acre were sampled in 2001. The number of dead plants was high in 1996, outnumbering live plants. Vigor has been generally good. Percent decadence decreased in 2001 from 31% to 21%. Annual leader growth on sagebrush was relatively good on a few plants, but overall it was minimal, averaging less than 2 inches over the entire site. Other shrubs found on the site include narrowleaf low rabbitbrush, broom snakeweed, snowberry, and gray horsebrush. A few juniper are also found on the site.

Although grasses dominate the herbaceous component, composition is poor. Cheatgrass is abundant and accounted for nearly 60% of the grass cover in both 1996 and 2001. Nested frequency for cheatgrass remained nearly the same between years even with drought. Common perennial grasses include bluebunch wheatgrass, bulbous bluegrass, and Sandberg bluegrass. In 2001, bluebunch wheatgrass was noted as being large and vigorous. Forbs are severely lacking for a mountain brush community with only 7 perennial species combined being sampled in 1996 and 2001. The only abundant perennial forb is arrowleaf balsamroot which accounts for over half of the forb cover. Low growing annual forbs have a higher sum of nested frequency compared to perennials and provide nearly as much cover in 2001.

1996 APPARENT TREND ASSESSMENT

The soil trend appears stable due to the abundance of vegetation and litter cover. There is little exposed bare soil. Browse trend appears to be downward due to a lack of reproduction for bitterbrush and mountain big sagebrush. The sagebrush population may continue to decline. Currently, dead plants outnumber live ones. It is doubtful that sagebrush seedlings can become established when competing with the vigorous herbaceous

understory dominated by winter annuals. Composition of the herbaceous understory is poor with the abundance of cheatgrass, Japanese brome, and annual forbs. Future trends will be dependent on how the composition changes in relation to these key species.

2001 TREND ASSESSMENT

Trend for soil is stable. Cover of bare ground is low and vegetation and litter cover are abundant and well disbursed over the site. Erosion is minimal. Trend for browse is stable. The bitterbrush population shows stable levels of use and decadence compared to 1996. The main negative factor for bitterbrush is the lack of reproduction. The mountain big sagebrush population slightly increased in density due to the emergence of some young in the population in 2001, but whether or not the young will persist will depend in part to precipitation patterns in the future. Decadency decreased on sagebrush, and use remains mostly light. Trend for the herbaceous understory is stable, but remains in poor condition. Cheatgrass still dominates the site, but bluebunch wheatgrass and Sandberg bluegrass remained at stable nested frequencies. Except for arrowleaf balsamroot, perennial forbs remain nearly non-existent. Sum of nested frequency for perennial grasses and forbs slightly increased.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - stable (3)

HERBACEOUS TRENDS --
Herd unit 02 , Study no: 41

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover %	
		'96	'01	'96	'01	'96	'01
G	Agropyron spicatum	152	153	50	52	6.18	6.96
G	Bromus japonicus (a)	45	*9	15	3	.37	.06
G	Bromus tectorum (a)	400	404	91	92	13.58	17.43
G	Poa bulbosa	42	*85	13	23	1.92	4.04
G	Poa fendleriana	-	-	-	-	.00	-
G	Poa secunda	138	123	52	45	1.95	1.67
G	Sitanion hystrix	-	3	-	1	-	.00
Total for Annual Grasses		445	413	106	95	13.95	17.50
Total for Perennial Grasses		332	364	115	121	10.06	12.68
Total for Grasses		777	777	221	216	24.02	30.19
F	Achillea millefolium	2	5	1	1	.03	.03
F	Alyssum alyssoides (a)	292	298	83	85	1.50	3.19
F	Astragalus utahensis	3	-	2	-	.04	-
F	Balsamorhiza sagittata	32	45	20	22	5.55	6.32
F	Collinsia parviflora (a)	12	1	4	1	.07	.00
F	Descurainia pinnata (a)	-	5	-	1	-	.00
F	Draba spp. (a)	-	4	-	2	-	.01

Type	Species	Nested Frequency		Quadrat Frequency		Average Cover %	
		'96	'01	'96	'01	'96	'01
F	Epilobium brachycarpum (a)	13	*-	7	-	.06	-
F	Erodium cicutarium (a)	-	*36	-	13	-	1.21
F	Eriogonum umbellatum	-	2	-	1	-	.00
F	Galium aparine (a)	3	-	1	-	.00	-
F	Hedysarum boreale	-	1	-	1	-	.03
F	Holosteum umbellatum (a)	40	50	17	19	.11	.09
F	Lactuca serriola	4	-	3	-	.06	-
F	Microsteris gracilis (a)	2	1	1	1	.00	.00
F	Ranunculus testiculatus (a)	27	10	14	6	.09	.03
F	Tragopogon dubius	15	7	7	5	.09	.07
F	Veronica biloba (a)	3	2	1	1	.00	.00
Total for Annual Forbs		392	407	128	129	1.85	4.56
Total for Perennial Forbs		56	60	33	30	5.78	6.46
Total for Forbs		448	467	161	159	7.64	11.02

* Indicates significant difference at alpha = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 02 , Study no: 41

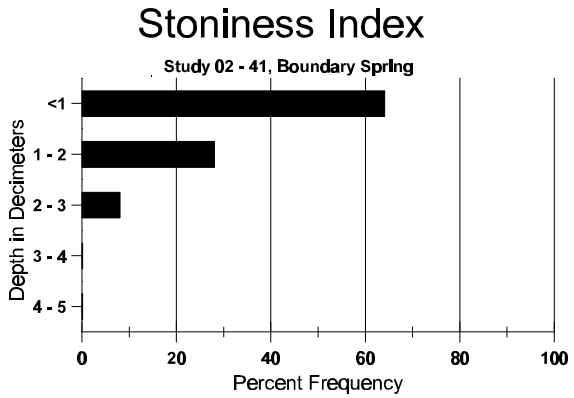
Type	Species	Strip Frequency		Average Cover %	
		'96	'01	'96	'01
B	Amelanchier alnifolia	0	1	-	.15
B	Artemisia tridentata vaseyana	18	20	3.36	4.71
B	Chrysothamnus viscidiflorus viscidiflorus	14	13	1.31	1.27
B	Gutierrezia sarothrae	8	12	.36	.15
B	Juniperus osteosperma	0	1	.00	.15
B	Purshia tridentata	27	23	8.30	7.92
B	Symphoricarpos oreophilus	2	1	.03	.15
B	Tetradymia canescens	4	4	.79	.30
Total for Browse		73	75	14.17	14.81

BASIC COVER --
Herd unit 02 , Study no: 41

Cover Type	Nested Frequency		Average Cover %	
	'96	'01	'96	'01
Vegetation	489	474	45.95	58.81
Rock	339	285	16.20	11.49
Pavement	202	266	3.28	5.13
Litter	495	482	48.12	49.75
Cryptogams	50	31	.42	.66
Bare Ground	128	151	2.49	4.35

SOIL ANALYSIS DATA --
Herd Unit 02, Study no: 41, Boundary Spring

Effective rooting depth (in)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
9.5	62.8 (11.6)	7.4	42.7	30.0	27.3	3.4	14.2	214.4	.6



PELLET GROUP FREQUENCY --
Herd unit 02 , Study no: 41

Type	Quadrat Frequency		Pellet Transect	
	'96	'01	Pellet Groups per Acre ⁄01	Days Use per Acre (ha) ⁄01
Sheep	5	10	383	N/A
Rabbit	1	1	-	-
Elk	42	6	157	12 (30)
Deer	23	38	679	52 (129)
Cattle	5	-	9	<1 (2)

BROWSE CHARACTERISTICS --
Herd unit 02 , Study no: 41

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
Y	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	-	1	-	-	-	-	-	-	-	1	-	-	-	20			1
M	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0	23	16	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'96	00%	00%	00%	
'01	100%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'96	0	Dec:	-
	'01	20		-

Artemisia tridentata vaseyana																		
Y	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	6	-	-	-	-	-	-	-	-	6	-	-	-	120			6
M	96	17	1	-	-	-	-	-	-	-	18	-	-	-	360	27	41	18
	01	13	1	1	-	-	-	1	-	-	15	-	-	1	320	30	42	16
D	96	-	6	2	-	-	-	-	-	-	8	-	-	-	160			8
	01	4	2	-	-	-	-	-	-	-	5	-	-	1	120			6
X	96	-	-	-	-	-	-	-	-	-	-	-	-	-	660			33
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	180			9

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'96	27%	08%	00%	+ 7%
'01	11%	04%	07%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'96	520	Dec:	31%
	'01	560		21%

Chrysothamnus viscidiflorus viscidiflorus																		
M	96	23	-	-	-	-	-	-	-	-	23	-	-	-	460	16	24	23
	01	18	-	-	-	-	-	-	-	-	17	1	-	-	360	13	22	18
D	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'96	00%	00%	00%	-17%
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'96	460	Dec:	0%
	'01	380		5%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Gutierrezia sarothrae																		
S	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	96	16	-	-	-	-	-	-	-	-	16	-	-	-	320	8	11	16
	01	19	-	-	-	-	-	-	-	-	19	-	-	-	380	7	13	19
D	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'96	00%	00%	00%	+20%
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'96	320	Dec:		0%
'01	400			5%

Juniperus osteosperma																		
S	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'96	00%	00%	00%	
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			
'96	0	Dec:	-
'01	20		-

Purshia tridentata																		
M	96	4	27	-	1	-	-	-	-	-	32	-	-	-	640	29	52	32
	01	6	14	4	-	2	-	-	-	-	24	2	-	-	520	35	63	26
D	96	-	-	3	-	-	-	-	-	-	3	-	-	-	60			3
	01	1	1	1	-	-	-	-	-	-	3	-	-	-	60			3
X	96	-	-	-	-	-	-	-	-	-	-	-	-	-	160			8
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'96	77%	09%	00%	-17%
'01	59%	17%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			
'96	700	Dec:	9%
'01	580		10%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Symphoricarpos oreophilus																		
M	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20	17	23	1
	01	1	-	-	-	-	-	-	-	-	1	-	-	-	20	20	25	1
D	96	-	1	-	-	-	-	-	-	-	1	-	-	-	20			1
	01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'96	50%	00%	00%	-50%
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'96	40	Dec:		50%
'01	20			0%

Tetradymia canescens																		
M	96	11	-	-	-	-	-	-	-	-	11	-	-	-	220	12	25	11
	01	6	-	-	-	-	-	-	-	-	6	-	-	-	120	9	21	6
D	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	01	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'96	00%	00%	00%	-36%
'01	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'96	220	Dec:		0%
'01	140			14%

SUMMARY

MANAGEMENT UNIT 2 - CACHE

Management unit 2 is large, covering the Wellsville Mountains, the Cache Valley, the Cache National Forest and the extensive rangeland around Woodruff, Randolph, and Bear Lake. Twelve trend studies sample winter ranges in the Wellsville subunit and along the lower winter ranges of the Cache Valley. A common trend on these sites is the poor condition of the herbaceous understories combined with high soil temperatures. Most of these sites support herbaceous understories which are dominated by annual brome grasses and weedy forbs. Annual grasses provide an average of 60% of the grass cover on these 12 study sites. Two sites, Green Canyon Exclosure and Broad Hollow, have low cover values for cheatgrass but are dominated by bulbous bluegrass (52% and 69% of the grass cover respectively). Many of the sites also show an increase in cheatgrass and a decline in Japanese brome between 1996 and 2001. These increasingly weedy understories are in some cases crowding out perennial grasses and limiting shrub reproduction. The increased dominance of annual grasses also increase the amounts of fine fuels which can carry a destructive wildfire.

One factor driving these trends is the high soil temperatures of these sites which average 71° F. With high soil temperatures, the soil profile dries out early in the season which gives winter annuals like cheatgrass a competitive advantage over more preferred perennial grasses. The average browse trend for these 12 winter range studies is stable (3.0) in 2001. The average herbaceous trend is 3.5 or between stable and slightly up. The improvement in the herbaceous understory trends comes primarily from a decline in cheatgrass and other annuals due to the dry conditions of 2001. Trend studies in the Wellsville subunit generally show light use by wildlife and improving browse trends.

Precipitation data from Logan and Richmond show an average of 18.3 inches of precipitation falls in the northern portion of the Cache Valley. From 1980 to 1986, precipitation was above normal averaging 26.3 inches during this 6-year period. A dry period followed between 1987 and 1990. From 1991 to 2000, dry conditions prevailed in 1992, 1994 and 2000, with above normal precipitation in 1991, 1993, and 1995-1998. Precipitation has been below normal during the spring of both 2000 and 2001.

Eleven trend studies sample winter ranges in Rich County. These sites have much lower soil temperatures and contain only small amounts of annual grasses. The average soil temperature of these sites is 58.6° F. The average browse trend is 3.1 or just above stable in 2001. The average herbaceous trend is also 3.1. Precipitation data from Laketown and Woodruff indicate above normal precipitation from 1980- 1987, followed by 3 years of drought, where only about half of the normal precipitation was received. Wet conditions prevailed during the next 8 years from 1991- 1999, with only 1992 being drier than normal. Precipitation was normal in Laketown in 2000, but only 67% of normal in Woodruff. In 2000, spring precipitation (April - June) was below normal for both sites. Spring precipitation (April - June) in 2001 was also poor averaging only 64% of normal at Laketown and 54% of normal at Woodruff.

The remaining higher elevation trend studies in the unit generally show stable browse and herbaceous trends. A summary table of trends on the unit follows.

TREND SUMMARY

	Category	1984	1990	1996	2001
High Creek 2-1	soil	est	3	5	3
	browse	est	3	3	2
	herbaceous understory	est	2	1	3
Mouth of Blacksmith Fork 2-2	soil	est	3	5	3
	browse	est	4	5	3
	herbaceous understory	est	1	1	2
Crow Mountain 2-4	soil	est	3	4	1
	browse	est	3	4	2
	herbaceous understory	est	4	1	3
Smithfield Dry Canyon 2-5	soil	est	3	5	susp
	browse	est	3	4	susp
	herbaceous understory	est	1	1	susp
Green Canyon Exclosure 2-6	soil			est	3
	browse			est	5
	herbaceous understory			est	3
Spawn Creek 2-7	soil	est	3	3	susp
	browse	est	3	3	susp
	herbaceous understory	est	4	3	susp
Millville Canyon 2-8	soil	est	3	4	susp
	browse	est	1	4	susp
	herbaceous understory	est	4	2	susp
Beirdneau 2-9	soil	est	3	3	3
	browse	est	3	3	3
	herbaceous understory	est	4	3	3
Broad Hollow 2-10	soil	est	3	4	susp
	browse	est	1	4	susp
	herbaceous understory	est	5	4	susp

1 = down, 2 = slightly down, 3 = stable, 4 = slightly up, 5 = up, est = established, susp = suspended

	Category	1984	1990	1996	2001
Second Dam Blacksmith Fork 2-12	soil	est	2	5	3
	browse	est	3	2	2
	herbaceous understory	est	3	3	3
Hardware Plateau 2-13	soil	est	3	4	3
	browse	est	1	4	3
	herbaceous understory	est	4	1	3
Dry Canyon 2-14	soil	est	3	4	susp
	browse	est	3	1	susp
	herbaceous understory	est	2	1	susp
Lower Hodges Canyon 2-15	soil	est	3	5	3
	browse	est	4	3	2
	herbaceous understory	est	5	1	5
Garden City Canyon 2-16	soil	est	3	4	2
	browse	est	3	3	3
	herbaceous understory	est	3	3	4
Meadowville 2-17	soil	est	2	5	2
	browse	est	2	1	1
	herbaceous understory	est	4	3	4
Upper Hodges Canyon 2-18	soil	est	3	4	susp
	browse	est	5	3	susp
	herbaceous understory	est	4	4	susp
Right Fork Logan Canyon 2-19	soil		est	5	3
	browse		est	5	3
	herbaceous understory		est	3	3
Richmond WMA 2-20	soil		est	5	2
	browse		est	1	4
	herbaceous understory		est	1	4

1 = down, 2 = slightly down, 3 = stable, 4 = slightly up, 5 = up, est = established, susp = suspended

	Category	1984	1990	1996	2001
Swan Creek 2-21	soil		est	5	2
	browse		est	3	4
	herbaceous understory		est	2	4
Box Elder Canyon 2-22	soil	est	3	3	susp
	browse	est	1	1	susp
	herbaceous understory	est	1	5	susp
Flat Bottom Canyon 2-23	soil	est	1	5	2
	browse	est	1	1	1
	herbaceous understory	est	3	2	4
Calls Fort Canyon 2-24	soil	est	3	4	3
	browse	est	1	5	5
	herbaceous understory	est	3	3	4
Mouth of Two Jump Canyon 2-25	soil	est	3	4	3
	browse	est	1	4	2
	herbaceous understory	est	5	3	5
Wellsville Canyon 2-26	soil		est	4	3
	browse		est	3	3
	herbaceous understory		est	3	4
Lake Town Canyon 2-27	soil	est	2	5	2
	browse	est	1	3	3
	herbaceous understory	est	4	5	2
North Eden 2-28	soil	est	2	5	3
	browse	est	1	2	2
	herbaceous understory	est	5	2	3
Woodruff Creek 2-29	soil	est	3	2	3
	browse	est	3	1	3
	herbaceous understory	est	3	2	3

1 = down, 2 = slightly down, 3 = stable, 4 = slightly up, 5 = up, est = established, susp = suspended

	Category	1984	1990	1996	2001
State Line 2-30	soil	est	3	3	3
	browse	est	3	3	3
	herbaceous understory	est	3	3	3
South Crawford Mountains 2-31	soil	est	2	3	3
	browse	est	1	4	4
	herbaceous understory	est	2	3	3
Wood Pass 2-32	soil	est	3	3	2
	browse	est	3	5	3
	herbaceous understory	est	3	3	3
Braizer Canyon 2-33	soil	est	2	3	3
	browse	est	3	3	3
	herbaceous understory	est	2	4	3
Otter Creek 2-34	soil	est	2	3	3
	browse	est	2	3	3
	herbaceous understory	est	3	3	3
Higgin's Hollow 2-35	soil	est	2	3	4
	browse	est	3	4	3
	herbaceous understory	est	4	2	4
Woodruff Co-op 2-36	soil		est	5	3
	browse		est	3	3
	herbaceous understory		est	3	3
Rock Creek Riparian 2-37	soil			est	susp
	browse			est	susp
	herbaceous understory			est	susp
Twin Creeks 2-38	soil			est	3
	browse			est	3
	herbaceous understory			est	3

1 = down, 2 = slightly down, 3 = stable, 4 = slightly up, 5 = up, est = established, susp = suspended